REVISIONS ATTACHED AFTER PAGE 17.

User Manual for the
HE690HPL100

Hand-Held Program Loader

Second Edition
May 19, 1998

MAN0217-02

PREFACE

This manual explains how to use the Horner Electric's Hand-Held Program Loader

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Note: The programming examples shown in this manual are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator.

TABLE OF CONTENTS

PREFACE 2
LIMITED WARRANTY AND LIMITATION OF LIABILITY 3
ABOUT PROGRAMMING EXAMPLES 3
TABLE OF CONTENTS 4
CHAPTER 1: INTRODUCTION 6
1.1 Product Description 6
1.2 Overview 7
1.2.1 General 7
1.2.2 Program Upload/Download (See Figure 1.2) 7
1.2.3 Local Start/Stop of a PLC (See Figures 1.2 and 1.3) 8
1.3 Requirements 9
1.4 Specifications 9
CHAPTER 2: OPERATOR GUIDE 10
2.1 Physical Characteristics of the HE690HPL100 10
2.1.1 Features 10
2.2 Reference Tables 11
2.3 Operational Procedures for the HE690HPL100 (See Section 1.2 for functional Overview) 12
2.3.1 General 12
2.3.2 Upload Procedures 12
2.3.3 Download Procedure 15
2.3.4 PLC Start Procedure 16
2.3.5 PLC Stop Procedure 16
APPENDIX A: PC MEMORY CARD HANDLING INSTRUCTIONS 17

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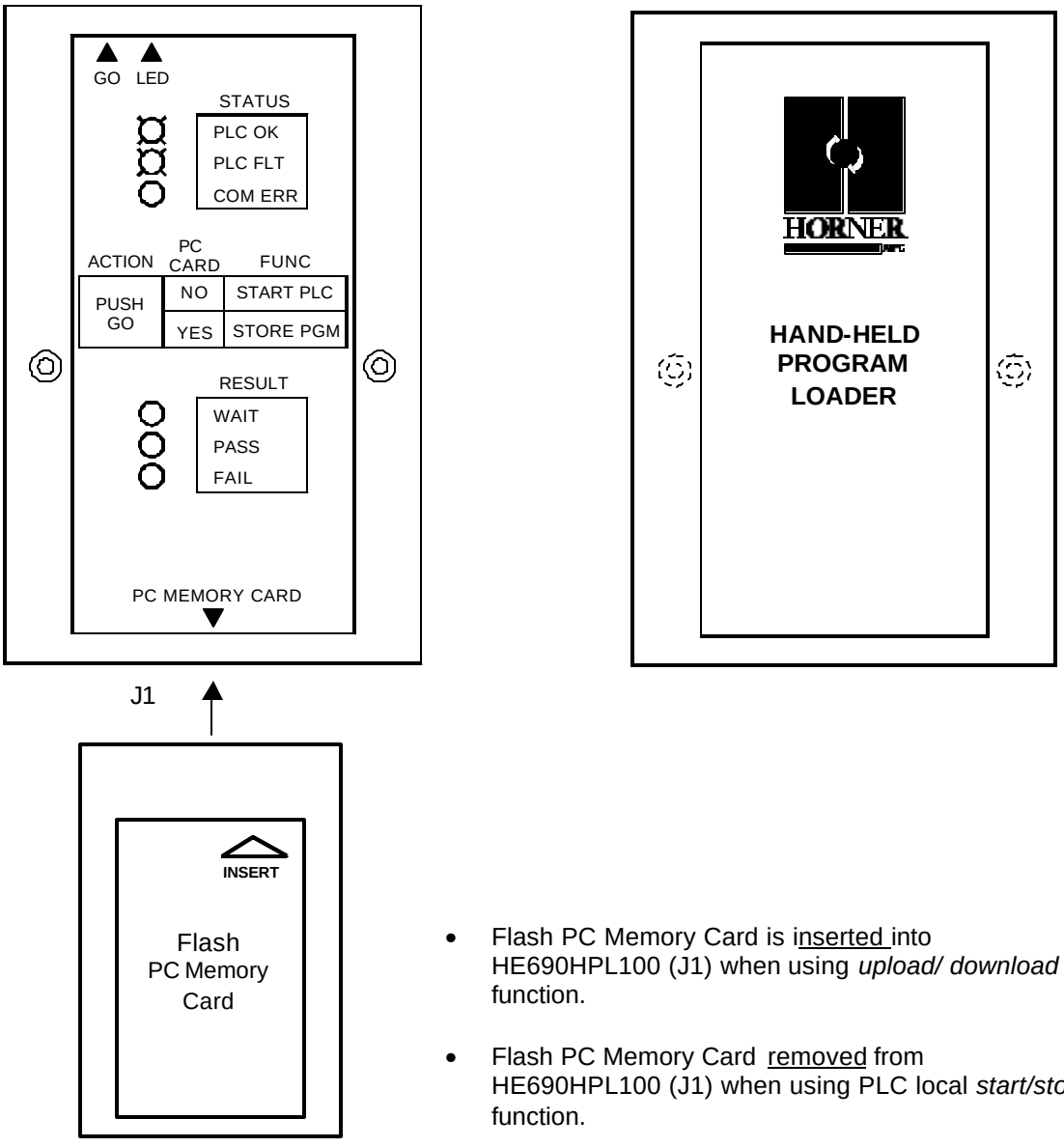
CHAPTER 1: INTRODUCTION

1.1 Product Description

1.1.1 The Horner Hand-Held Program Loader (HE690HPL100) allows users to quickly and conveniently upload a program *from* a PLC to a Flash PC Memory Card and download a program *to* a PLC from a Flash Memory Card. The upload/download function requires the user to insert a Flash PC Memory Card into the HE690HPL100 to obtain or store a program. In addition, the HE690HPL100 allows users to locally start or stop a PLC. In such instances, the Flash PC Memory Card is not inserted in the HE690HPL100. (See Figure 1.1.) *See Appendix A for instructions regarding the use and storage of the PC memory card.*



- Flash PC Memory Card is inserted into HE690HPL100 (J1) when using *upload/ download* function.
- Flash PC Memory Card removed from HE690HPL100 (J1) when using PLC local *start/stop* function.

Figure 1.1 – Front View and Back View of HE690HPL100 (Shown with Flash PC Memory Card)

1.2 Overview

1.2.1 General

1.2.1.1 The four functions of the HE690HPL100 include:

a. Uploading
b. Program Downloading
c. Starting a PLC
d. Stopping a PLC

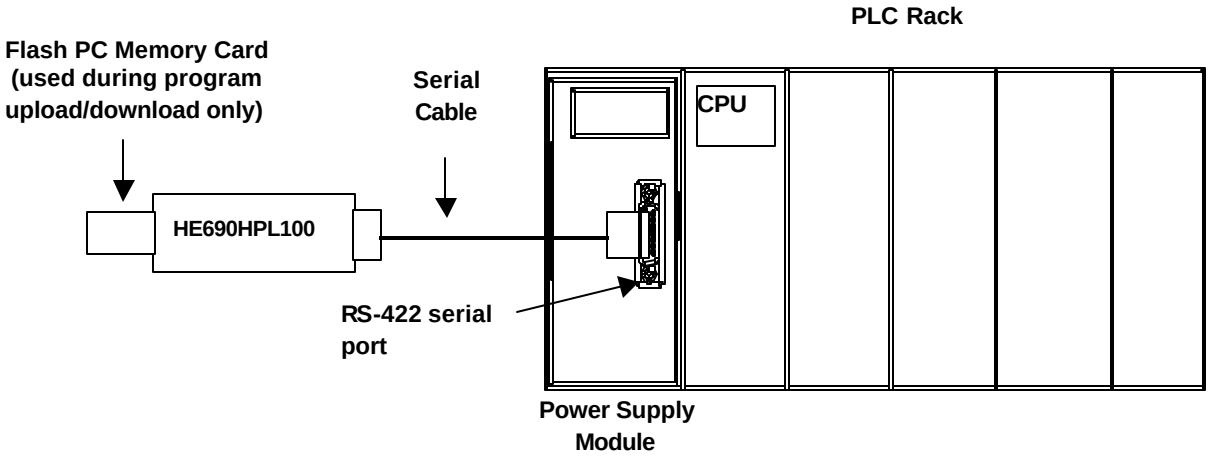


Figure 1.2 – Overview of HE690HPL100

1.2.2 Program Upload/Download (See Figure 1.2)

1.2.2.1 The following explanation describes the program upload/download functions of the HE690HPL100 and provides examples when each function is used.

NOTE: During the **upload procedure,** it is determined what type of information will be **downloaded** and also where the information will be stored in the PLC (RAM or EEPROM).

a. Upload Function (See Chapter 2 for upload procedures)

Uploading refers to copying a PLC program to a Flash PC Memory Card using an HE690HPL100. The Stop/Upload button (S2) on the HE690HPL100 is used during the upload function. S2 is located on top of the module and unlike the Run/Download button (S1), the S2 button is not easy to access. Because the S2 button is recessed, the user is required to use a thin probe (or a similar nonconductive object) to push the button. (See Figure 1.3.)

Example: An Original Equipment Manufacturer (OEM) updates the software of one of its products and needs to provide the changes to its customers. The OEM uploads the revised program from a PLC using an HE690HPL100 to a Flash PC Memory Card. The HE690HPL100 contains a micro-processor that stores the program to a Flash PC Memory Card. The OEM is now able to provide the updated Flash PC Memory Card to a customer who requires the software changes.

b. Download Function (See Chapter 2 for download procedures.)

Downloading refers to copying a Flash PC Memory Card program to a PLC using an HE690HPL100. The GO or Run/Download button (S1) on the HE690HPL100 is used during the download function. S1 is located on top of the module and is easy to access. (See Figure 1.3.)

Example: A customer receives a Flash PC Memory Card containing software updates from an Original Equipment Manufacturer (OEM). The customer downloads the program from the Flash PC Memory Card to the PLC using an HE690HPL100 and now has the required updates.

1.2.3 Local Start/Stop of a PLC (See Figures 1.2 and 1.3)

The HE690HPL100 allows a user to easily and conveniently start or stop a local PLC. As shown in Figure 1.2, the HE690HPL100 is connected to the PLC via an RS-422 cable. However, the Flash PC Memory Card is removed from the HE690HPL100 when starting or stopping the PLC.

a. Starting a PLC with an HE690HPL100 (See Chapter 2 for starting procedures.)

The GO or Run/Download button (S1) on the HE690HPL100 is used to start the PLC. S1 is located on top of the module and is easy to access. (See Figure 1.3.)

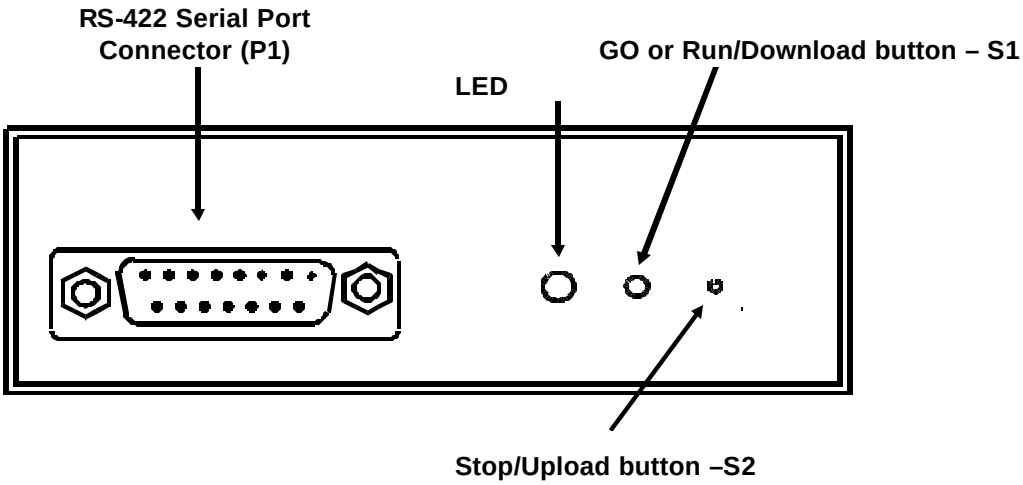


Figure1.3 – Top View of HE690HPL100 Module

Table 1.1 –Function Summary Table (S1 & S2)			
Button	**Physical Characteristic**	**Flash PC Card**	**Function**
GO or Run/Down Load (S1)	Exposed	Removed	PLC Start
		Inserted	Download program to PLC
Stop/ Up Load (S2)	Recessed (Access with thin probe or other nonconductive object)	Removed	PLC Stop
		Inserted	Upload program from PLC

b. Stopping a PLC with an HE690HPL100 (See Chapter 2 for stopping procedures.)

The Stop/Upload button (S2) on the HE690HPL100 is used to stop the PLC. S2 is located on top of the module and unlike the GO or Run/Download button (S1), the S2 button is not easy to access. Because the S2 button is recessed, the user is required to use a thin probe (or a similar nonconductive object) to push the button. (See Figure 1.3.)

1.3 Requirements

1.3.1 Depending upon the function that the HE690HPL100 is being used for, the following equipment and parts are required:

a. Hand-Held Program Loader: (HE690HPL100)
b. RS-422 Cable: (HE693CBL150)
c. Flash PC Memory Card: (HE690PGM100)

NOTE: The Flash PC Memory Card is used for Program Upload/Download function only . One program is provided per Flash PC Memory Card

1.4 Specifications

Table 1.1 - Power Draw Test for HE690HPL100 Hand-Held Programmer	
Inrush	40mA @ 5Vdc
Steady State	25mA @ 5Vdc
Notes: Oscilloscopes set at 10mV/DIV and current probe set at 50 mA/DIV for steady state level. Steady state refers to the situation where there is no I/O interaction between the unit and a PLC. In the Steady state, the unit is inactive and draws the least amount of current. Inrush refers to the moment when the unit is first powered-up, and the most amount of current is drawn from the PLC.	

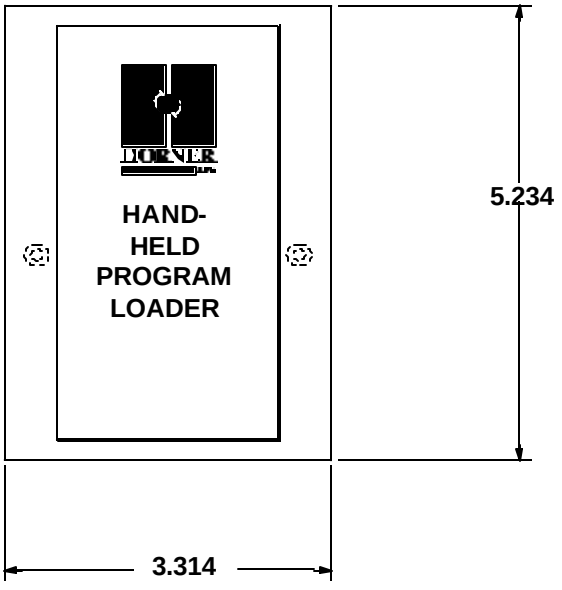


Figure 1.4 – Dimensions, Back View

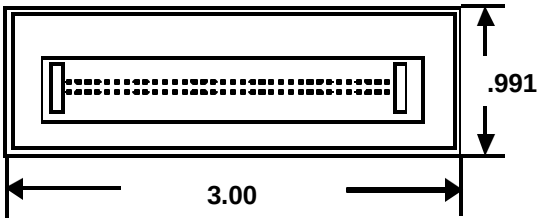


Figure 1.5 – Dimensions, Bottom View

CHAPTER 2: OPERATOR GUIDE

2.1 Physical Characteristics of the HE690HPL100

2.1.1 Features

2.1.1.1 Before operating the HE690HPL100, the user must be familiar with HE690HPL100's switches , connectors, and LED. For a description of the main features of the HE690HPL100, match the alphabetical letters shown in Figures 2.1, 2.2, and 2.3 with the explanation that follows.

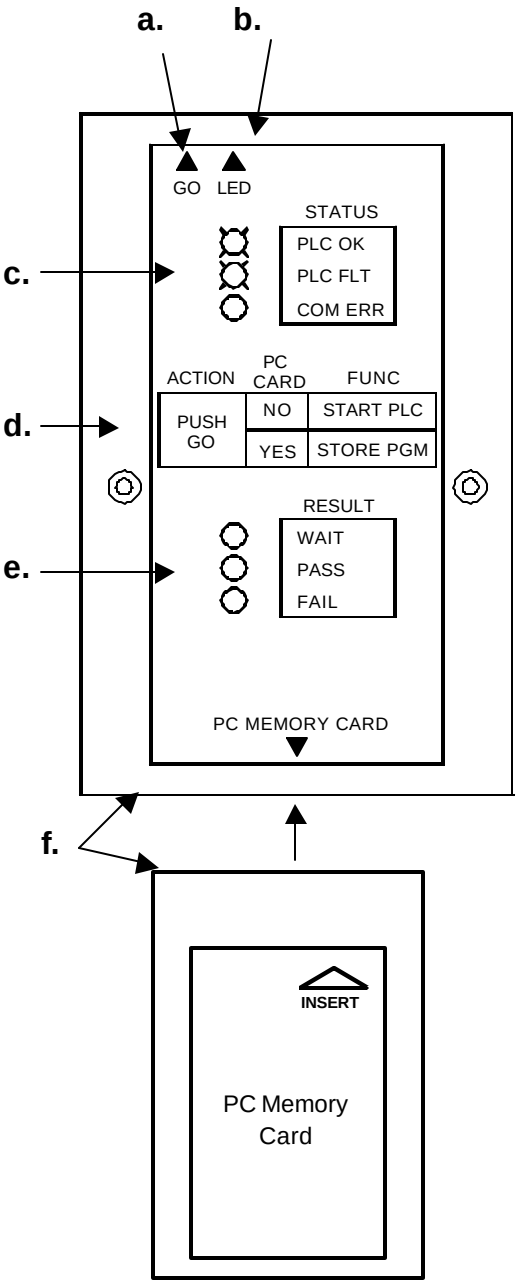


Figure 2.1 – Front View of HE690HPL100 (Shown with Flash PC Memory Card)

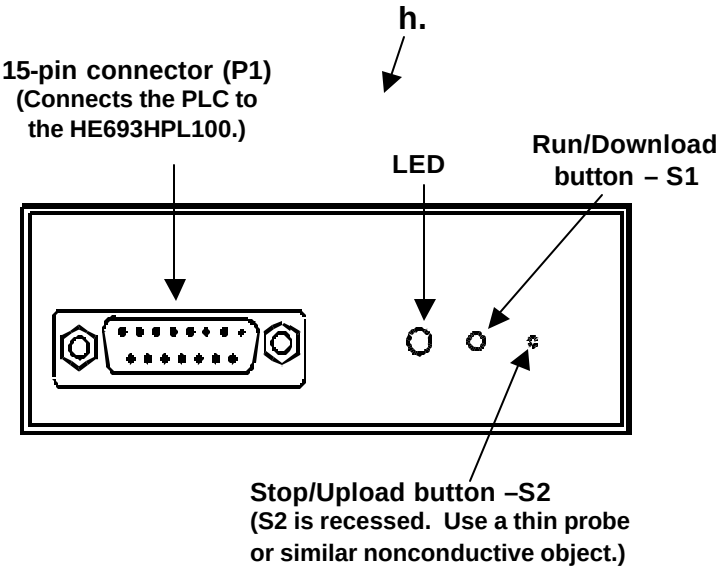

h.
15-pin connector (P1)
(Connects the PLC to the HE693HPL100.)
LED
Run/Download button – S1
Stop/Upload button –S2
(S2 is recessed. Use a thin probe or similar nonconductive object.)

Figure 2.2 – Top View of HE690HPL100

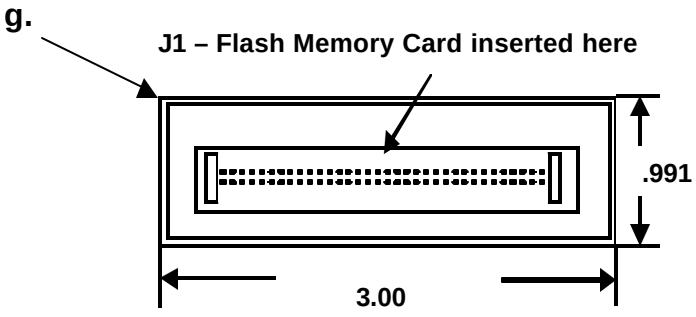


Figure 2.3 – Bottom View of HE690HPL100

a. The **GO** label is shown on the front panel of the HE690HPL100 and points to the Run/Download button (S1) located on the top-side of the module . S1 is also referred to as the "GO" switch.

b. The **LED** label is shown on the front panel of the HE690HPL100 and points to the status indicator located on the top-side of the module.

NOTE: Items c,d, and e provide a quick reference for the user.

c. Denotes the possible power-up status indications of the LED.

d. Depicts a functional table to assist the user.

e. Denotes the possible operational results indicated by the LED.

f. The Flash PC Memory Card is inserted into HE690HPL100 when using *upload/download* function. The Flash PC Memory Card is removed from HE690HPL100 when using PLC local *start/stop* function. Only one program is stored per Flash PC Memory Card (HE690PGM100).

g. The Flash PC Memory Card plugs into **J1** which is located on the bottom-side of the HE690HPL100.

h. Shows the switches, connector and LED located on the top-side of the module.

2.2 Reference Tables

2.2.1 By default, reference tables are copied along with the program and configuration during the *upload* function. The reference tables that are copied by the HE690HPL100 include:

a. Analog Inputs (%AI)
b. Analog Outputs (%AQ)
c. Register (%R)
d. Discrete Inputs (%I)
e. Discrete Outputs (%Q)
f. Discrete Temporaries (%T)
g. Discrete Internals (%M)
h. Genius Global Data (%G)

NOTE: If reference tables are not to be copied along with the program and configuration, be sure to use the appropriate upload procedure in Section 2.3.1

2.3 Operational Procedures for the HE690HPL100 (See Section 1.2 for functional Overview)

2.3.1 General

2.3.1.1 The four functions of the HE690HPL100 include:

a. Program uploading
b. Program downloading
c. Starting a PLC
d. Stopping a PLC

2.3.1.2 Figure 2.4 depicts the data flow direction during upload/download functions.

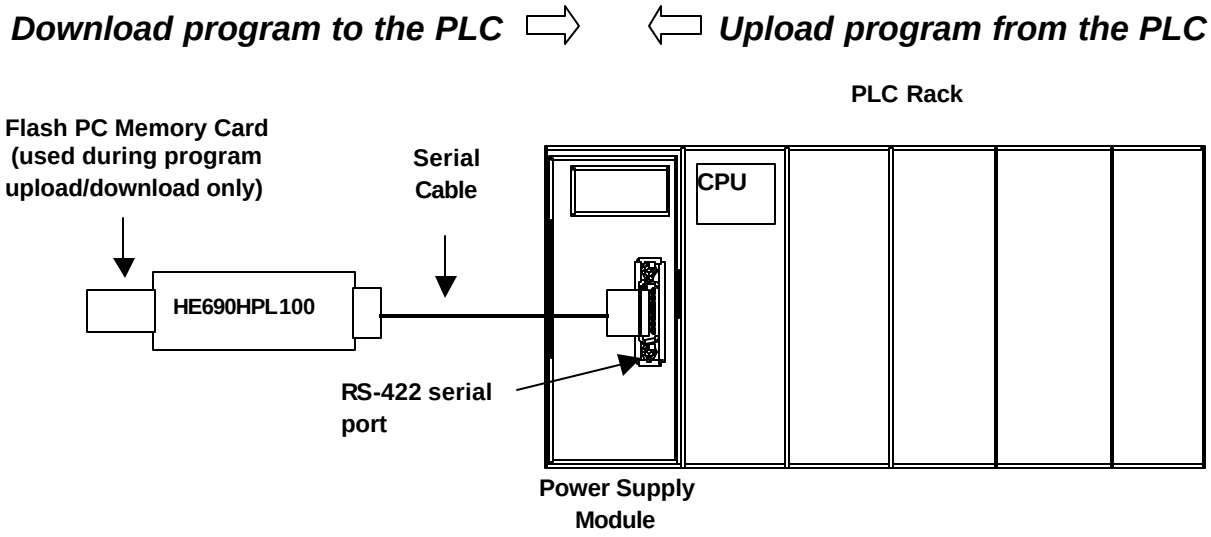


Figure 2.4 - Direction of Data Flow When Uploading/Downloading

2.3.2 Upload Procedures

Uploading a program from a PLC (See Figure 2.5 for an Upload Procedure Flowchart)

1. Before powering-up the HE690HPL100, the user must consider the following question:

   Do reference tables need to be copied along with the program and configuration data?
   (General information covering reference tables is provided in Section 2.2.)

   If the answer to the question is "Yes" (This is the Default):
   a. Make sure that the PC card is *not* write-protected. Insert the Flash PC Memory Card into the HE690HPL100 (J1). (Figure 2.1 & 2.3)
   b. Connect the HE690HPL100 to the PLC by inserting an RS-422 cable into HE690HPL100 (P1).(Figure 2.2). Wait for a power-up status indication on the LED (Figure 2.2) as described in Table 2.1. It may take a couple of seconds for HE690HPL100 do provide the power-up status as it tries to setup communication with the PLC. **Go to Step 2.**

   If the answer to the question is "No" :
   a. Switch off the PLC.
   b. Make sure that the PC card is *not* write-protected. Insert the Flash PC Memory Card into the HE690HPL100 (J1). (Figure 2.1 & 2.3)
   c. Connect the HE690HPL100 to the PLC by inserting an RS-422 cable into HE690HPL100 (P1). (Figure 2.2).

d. **Press the GO or RUN/Download button (S1) *and hold down* while switching the PLC to "On." Continue holding down S1 until the LED *blinks green*. Then, release S1.** Wait for a Power-up Status indication on LED (Figure 2.2) as described in Table 2.1. It may take a couple of seconds for HE690HPL100 to provide the power-up status as it tries to setup communication with the PLC. **Go to Step 2.**

2. Wait for a Power-up Status indication on the LED (Figure 2.2) as described in Table 2.1.

   If the unit shows a Communications Error (solid red indication) or no status, check the HE690HPL100's connections and ensure that the PLC is "OK.". When the unit shows that the unit is ready (blinking green or orange), proceed to the next step. Note, however, that PLC faults are present with the blinking orange indication, and the user might want to clear the faults first.

Table 2.1 – HE690HPL100 Power- up Status		
LED Color	**LED State**	**Meaning**
Green	Blinking	Unit ready, no PLC faults
Orange	Blinking	Unit ready, PLC faults present
Red	Solid	Communications Error

Note: The PLC does *not* need to be in "Stop" mode when uploading the program.

3. Once the unit is ready (LED blinks green or orange), the user is able to upload the program from the PLC. Before ***uploading***, however, the user must consider what type of PLC memory the program will eventually be ***downloaded*** to (i.e., RAM or EEPROM). The default memory is RAM. This consideration is important, because the upload procedure in this step (Step 3.) differs slightly according to the type of memory selected.

   There are instances when a program needs to be **downloaded** into the EEPROM of the PLC. It is during the **upload procedure** (Step 3) that the parameter is set. As a result, all users must consider the following question before proceeding:

   When the program is eventually downloaded to the PLC, does the program need to be copied into EEPROM?

   If the answer to the question is "No":
   Simply **press the Stop/Upload button (S2) and release**. The user needs to use a thin probe (or a similar nonconductive object) to press S2, because S2 is recessed. (Refer to Figure 2.2.). The status LED will show Operation in Progress (solid orange). Do not remove PC card when download operation is in progress. In this case, the program will be stored into RAM when it is eventually downloaded using a download operation. **Go to Step 4.**

   If the answer to the question is "Yes":
   Simply **press Stop/Upload button (S2) and hold *until* LED blinks orange (takes approximately 3 seconds).** The user needs to use a thin probe (or a similar nonconductive object) to press S2, because S2 is recessed. (Refer to Figure 2.2.) If the button is released *before* the orange blink occurs, the program will not be copied into EEPROM during download. After the orange blink, the status LED will show Operation in Progress (solid orange). Do not remove PC card when download operation is in progress. **Go to Step 4.**

4. The LED provides result indications as depicted in Table 2.2.

Table 2.2 – HE690HPL100 Status/Result		
LED Color	**LED State**	**Meaning**
Orange	Solid	Operation in progress
Green	Solid	Operation successful
Red	Blinking	PC card fault
Red	Solid	Communications Error

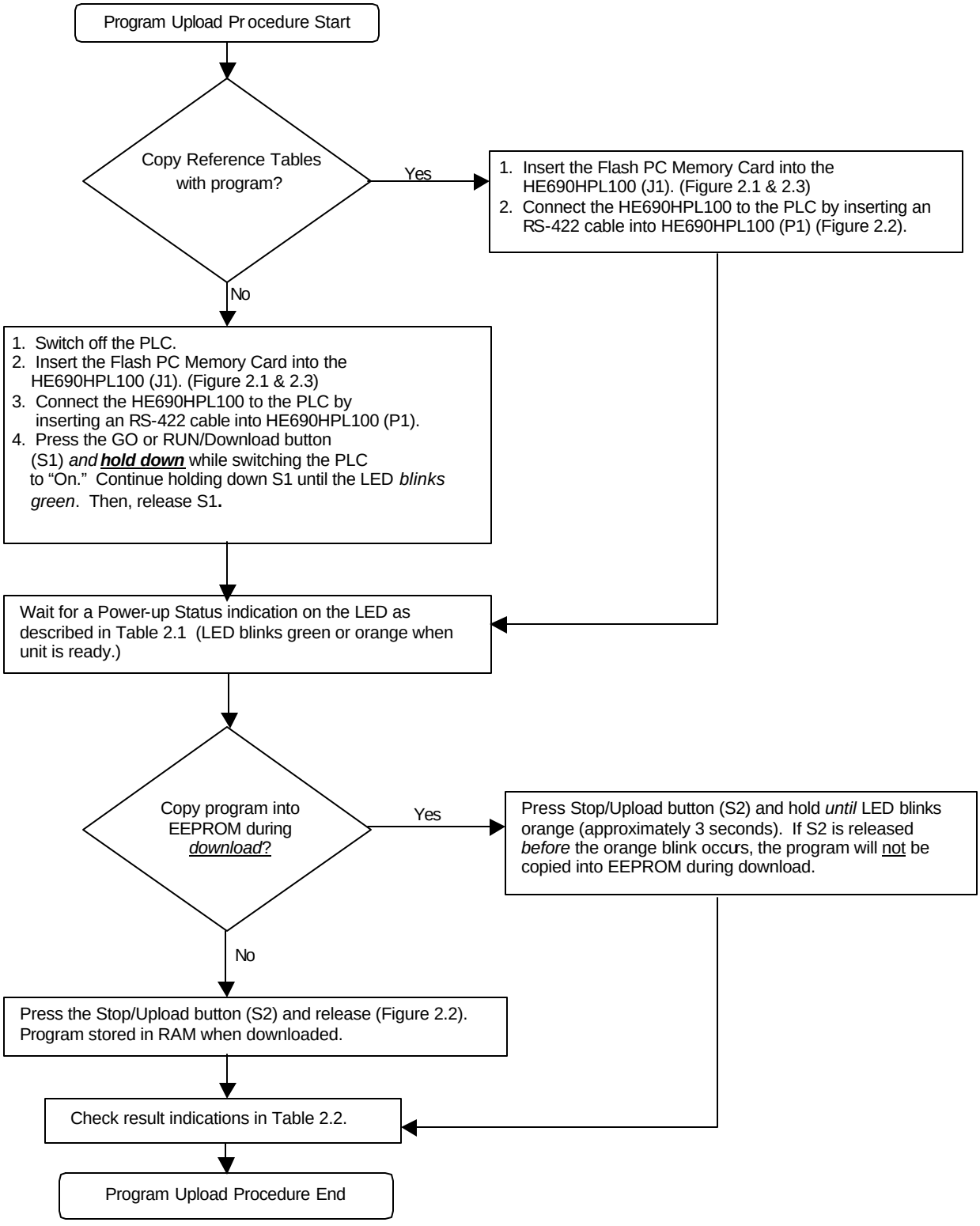

Program Upload Procedure Start
Copy Reference Tables with program?
Yes
1. Insert the Flash PC Memory Card into the HE690HPL100 (J1). (Figure 2.1 & 2.3)
2. Connect the HE690HPL100 to the PLC by inserting an RS-422 cable into HE690HPL100 (P1) (Figure 2.2).
No
1. Switch off the PLC.
2. Insert the Flash PC Memory Card into the HE690HPL100 (J1). (Figure 2.1 & 2.3)
3. Connect the HE690HPL100 to the PLC by inserting an RS-422 cable into HE690HPL100 (P1).
4. Press the GO or RUN/Download button (S1) *and* ***hold down*** while switching the PLC to "On." Continue holding down S1 until the LED *blinks green*. Then, release S1.
Wait for a Power-up Status indication on the LED as described in Table 2.1 (LED blinks green or orange when unit is ready.)
Copy program into EEPROM during *download*?
Yes
Press Stop/Upload button (S2) and hold *until* LED blinks orange (approximately 3 seconds). If S2 is released *before* the orange blink occurs, the program will not be copied into EEPROM during download.
No
Press the Stop/Upload button (S2) and release (Figure 2.2). Program stored in RAM when downloaded.
Check result indications in Table 2.2.
Program Upload Procedure End

Figure 2.5 – Upload Procedure Flowchart

a. In case of PC card fault, ensure:
   1. The PC Memory Card is an Intel, Series II compatible Flash Memory Card with 5V DC operating voltage and 12V DC programming voltage.
   2. The Flash PC Memeory Card is not write-protected.

b. In case of Communication Error:
   1. Check the Program Loader – PLC connection and make sure that the PLC is 'OK'.
   2. Make sure that the PLC is not OEM Locked. (If using LogicMaster 90 [LM90], the OEM setting is with password protection.)

5. **Press and release the GO or RUN/Download button (S1).** The HE690HPL100 then displays the unit status (Table 2.1) and is ready for the next operation. *After successful upload of the program, write-protect the PC memory card to avoid accidentally overwriting the program* . (Note that the upload switch (S2) is recessed to avoid accidental erasure of a program on the PC memory card).

2.3.3 Download Procedure

During the upload procedure, it is determined *what* type of information will be downloaded and also *where* the information will be stored (RAM or EEPROM).

1. Connect the HE690HPL100 to the PLC (Figure 2.4).
2. Switch ON the PLC, if not already ON. Wait for the power-up status of HE690HPL100. It may take a couple of seconds for HE690HPL100 to provide the power-up status as it tries to setup communication with the PLC. Make sure that HE690HPL100 shows Unit Ready status (status LED blinks green or orange). If HE690HPL100 shows Communication Error (status LED shows solid red) or does not show any status, check the connection and ensure that the PLC is 'OK'.
3. Insert the Flash PC Memory Card containing the program to be downloaded into the HE690HPL100 (J1) (Figures 2.1 and 2.3).
4. Note that the PLC will be automatically placed in Stop mode during the program download operation (if not already stopped). After successful download, PLC will be placed in Run mode.
5. Before downloading the program to the PLC, the user will need to consider the following question:

   Do the reference tables need to be cleared *after* successful download of the program to the PLC?

   If the answer to the question is "No" or "As decided by the OEM":

   Simply **press and release the GO or Run/Download button (S1)** (Figure 2.2).

   This starts the Download of programs to the PLC. The status LED shows Operation in Progress (solid orange). Do not remove the PC card when download operation is in progress.

   If the Memory Card contains registers written during program upload (by the OEM), the registers will be overwritten by the HE690HPL100 with those values during download. If the Memory Card contains no registers written during program upload (by OEM), the registers will be unchanged by the HE690HPL100 during download.

   If the answer to the question is "Yes":

   Press the GO or Run/Download button (S1) and hold *until* LED blinks orange (takes approximately 3 seconds) (Figure 2.2). If the Go button is released before the orange blink occurs, the reference tables will not be cleared upon download.

   After the orange blink, status LED shows Operation in Progress (solid orange). Do not remove the PC card when download operation is in progress. The program and configuration on the PC card is then stored to the PLC. In this case, after successful download, the reference tables are cleared.

NOTE: The program is also copied to PLC EEPROM if the choice was made to do so during program *upload.*

6. After the program is successfully downloaded, the PLC is placed into the Run mode. The results are described in Table 2.2.

   a. In case of PC card fault (status LED blinks red), make sure that the PC card contains valid program data.
   b. In case of Communication Error (status LED shoes solid red):
      1. Check the Program Loader – PLC connection and make sure that the PLC is 'OK'.
      2. Make sure that the PLC attached is of same type (351, 313 etc.) as of the PLC used for storing the programs to PC card.
      3. If the configuration stored on the Flash Memory PC Card has passwords enabled, the PLC passwords also need to be enabled. If they are disabled, programs will not be copied.
      4. Make sure that the PLC is not OEM Locked. (If using LogicMaster 90 [LM90], the OEM setting is with password protection.)
7. **Press and release the GO or RUN/Download button (S1)**. The HE690HPL100 then displays the unit status (Table 2.1) and is ready for next operation.

2.3.4 PLC Start Procedure

1. Connect the HE690HPL100 to the PLC (Figure 2.4).
2. Switch ON the PLC, if not already ON. Wait for the power-up status of HE690HPL100. It may take a couple of seconds for HE690HPL100 do provide the power-up status as it tries to setup communication with the PLC. Make sure that HE690HPL100 shows Unit Ready status (status LED blinks green or orange). If HE690HPL100 shows Communication Error (status LED shows solid red) or does not show any status, check the connection and ensure that the PLC is 'OK'.
3. Ensure that the Flash PC Memory Card is removed from the HE690HPL100 (Figure 2.1).
4. Press and release the GO or Run/Download button (S1) (Figure 2.2). Wait for PLC faults (if any) to clear and for the PLC to be placed in Run mode.
5. Check LED for result indications in Table 2.2.
6. In case of Communication Error (status LED shows solid red):
7. Check the Program Loader – PLC connection and make sure that the PLC is 'OK'.
8. After displaying the operation results (Table 2.2) for a brief period, the HE690HPL100 displays the unit status (Table 2.1) and is then ready for next operation.

2.3.5 PLC Stop Procedure

1. Connect the HE690HPL100 to the PLC (Figure 2.4).
2. Switch ON the PLC, if not already ON. Wait for the power-up status of HE690HPL100. It may take a couple of seconds for HE690HPL100 do provide the power-up status as it tries to setup communication with the PLC. Make sure that HE690HPL100 shows Unit Ready status (status LED blinks green or orange). If HE690HPL100 shows Communication Error (status LED shows solid red) or does not show any status, check the connection and ensure that the PLC is 'OK'.
3. Ensure that the Flash PC Memory Card is removed from the HE690HPL100 (Figure 2.1).
4. Press and release the Stop/Upload button (S2). The user needs to use a thin probe (or a similar nonconductive object) to press S2, because S2 is recessed. The PLC is placed in Stop mode.
5. Check LED for result indications in Table 2.2.
6. In case of Communication Error (status LED shows solid red):
7. Check the Program Loader – PLC connection and make sure that the PLC is 'OK'.
8. After displaying the operation results (Table 2.2) for a brief period, HE690HPL100 displays the unit status (Table 2.1) and is then ready for next operation.

APPENDIX A: PC MEMORY CARD HANDLING INSTRUCTIONS

The following precautions and guidelines will help in avoiding damage to the HE690PGM100 Flash PC Memory Card.

1. **Do not remove HE690PGM100 from the program loader HE690HPL100 when a Program Upload or a Program Download operation is in progress.**

2. Do not use or store HE690PGM100 in conditions of extreme temperature or humidity.

3. To ensure that the data on the HE690PGM100 is not accidentally overwritten, make sure that HE690PGM100 is Write Protected (A Write Protect switch [located on the edge of HE690PGM100] is provided for this purpose).

4. When not in use, store HE690PGM100 in a dry place.

5. Do not drop, bend or crush the HE690PGM100 PC card.

6. Keep the connector J1 of the HE690HPL100, used for inserting the PC card clean.

27 July 1998

Revision pages for

Horner Electric's Hand-Held Program Loader User Manual

HE690HPL100, Second Edition

Attached to this cover page is a revision for the Horner Electric's **Hand-Held Program Loader** User Manual dated 19 May 1998. **(MAN0217-02)**

THESE REVISED REQUIREMENTS ARE NOW IN EFFECT.

New and revised pages may be issued periodically. For user manual updates, please contact Horner Electric Advanced Products Group, Technical Support Division, at (317) 916-4274 or visit our website at www.heapg.com.

Revision Key

Changes to text, tables or graphics contained in the attached revision are indicated as follows:

1. **Added text is underlined.**
2. **~~Deleted text is lined through.~~**
3. **New, revised, or deleted items are specified as such in ( ).**

List of Effective Pages

The most current user manual consists of the following list of effective pages including the attached revision pages: * Denotes new or revised pages

Page **Date**

Front Cover……Contained in MAN0217-02 dated 19 May 1998
2 - 6……Contained in MAN0217-02 dated 19 May 1998
***7……Revision Pages dated 27 July 1998**
8……..Contained in MAN0217-02 dated 19 May 1998
***9……Revision Pages dated 27 July 1998**
10 -17……Contained in MAN0217-02 dated 19 May 1998

1.2 Overview

1.2.1 General

1.2.1.1 The four functions of the HE690HPL100 include:

(REVISED)

a. Program Uploading
b. Program Downloading
c. Starting a PLC
d. Stopping a PLC

(Item a revised 27 July 1998)

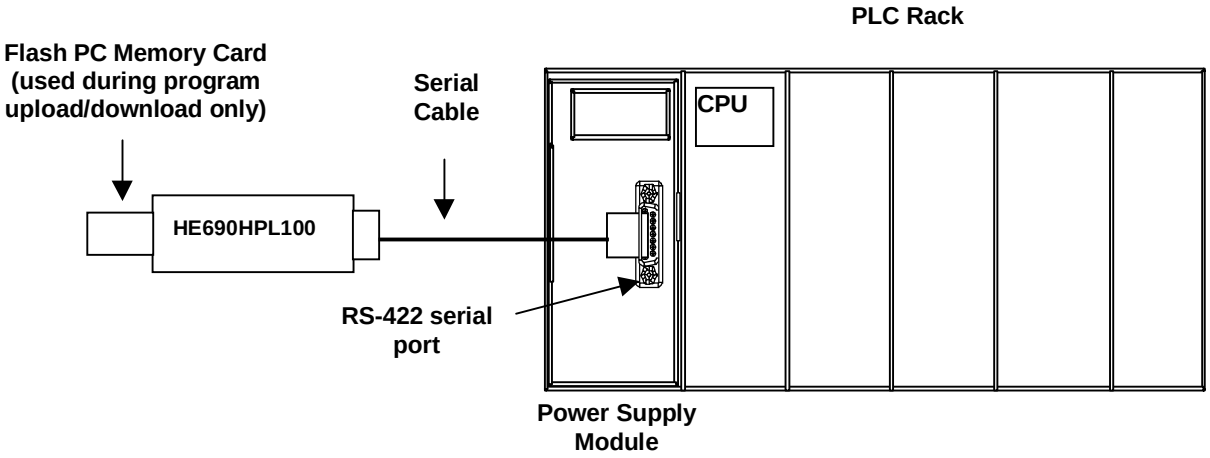


Figure 1.2 – Overview of HE690HPL100

1.2.2 Program Upload/Download (See Figure 1.2)

1.2.2.1 The following explanation describes the program upload/download functions of the HE690HPL100 and provides examples when each function is used.

NOTE: During the **upload procedure,** it is determined what type of information will be **downloaded** and also where the information will be stored in the PLC (RAM or EEPROM).

a. Upload Function (See Chapter 2 for upload procedures)

Uploading refers to copying a PLC program to a Flash PC Memory Card using an HE690HPL100. The Stop/Upload button (S2) on the HE690HPL100 is used during the upload function. S2 is located on top of the module and unlike the Run/Download button (S1), the S2 button is not easy to access. Because the S2 button is recessed, the user is required to use a thin probe (or a similar nonconductive object) to push the button. (See Figure 1.3.)

Example: An Original Equipment Manufacturer (OEM) updates the software of one of its products and needs to provide the changes to its customers. The OEM uploads the revised program from a PLC using an HE690HPL100 to a Flash PC Memory Card. The HE690HPL100 contains a micro-processor that stores the program to a Flash PC Memory Card. The OEM is now able to provide the updated Flash PC Memory Card to a customer who requires the software changes.

b. Stopping a PLC with an HE690HPL100 (See Chapter 2 for stopping procedures.)

The Stop/Upload button (S2) on the HE690HPL100 is used to stop the PLC. S2 is located on top of the module and unlike the GO or Run/Download button (S1), the S2 button is not easy to access. Because the S2 button is recessed, the user is required to use a thin probe (or a similar nonconductive object) to push the button. (See Figure 1.3.)

1.3 Requirements

(REVISED)

1.3.1 Depending upon the function that the HE690HPL100 is being used for, the following equipment and parts are required: The HE690HPL100 requires the PLC processor to be a version 5.01 or greater.

(Paragraph 1.3.1 revised 27 July 1998)

a. Hand-Held Program Loader: (HE690HPL100)
b. RS-422 Cable: (HE693CBL150)
c. Flash PC Memory Card: (HE690PGM100)

NOTE: The Flash PC Memory Card is used for Program Upload/Download function only . One program is provided per Flash PC Memory Card

1.4 Specifications

Table 1.1 - Power Draw Test for HE690HPL100 Hand-Held Programmer	
Inrush	40mA @ 5Vdc
Steady State	25mA @ 5Vdc
Notes: Oscilloscopes set at 10mV/DIV and current probe set at 50 mA/DIV for steady state level. Steady state refers to the situation where there is no I/O interaction between the unit and a PLC. In the Steady state, the unit is inactive and draws the least amount of current. Inrush refers to the moment when the unit is first powered-up, and the most amount of current is drawn from the PLC.	

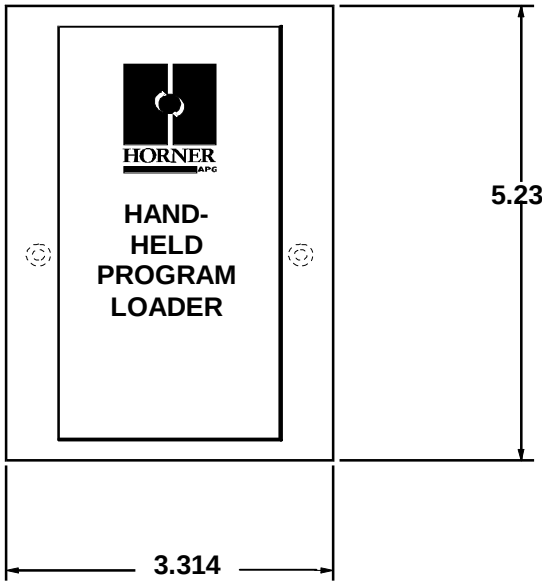


Figure 1.4 – Dimensions, Back View

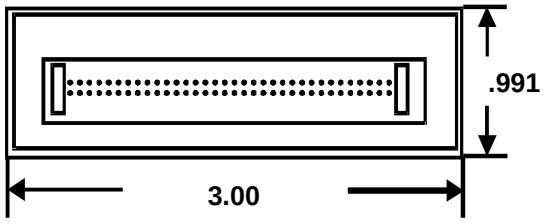


Figure 1.5 – Dimensions, Bottom View